"MODULAR POOL CONSTRUCTIVE DESIGN"

Field of the invention

The present invention refers to the construction of pool and, more specifically, to pools made up of standardised dimension modules.

Background of the state of the art

The growing popularity of pools for recreational, therapeutic and domestic use has resulted in the creation of a plurality of types and models, intended to meet the market's large variety expectations. Among others, the following can be mentioned as the most widely spread:

concrete pools, lined with tiles, miniature tiles or vinyl linings;

fibreglass pools, manufactured according to standardised dimensions and shapes;

mixed type pools, with concrete base (bottom) and blocks, clay bricks or metallic sheets, usually waterproofed with vinyl lining or fibreglass skin.

However, constructing pools of the above mentioned types is a relatively complex, slow and expensive process, since, in addition to requiring specialised labour, they have disadvantages inherent to their nature.

In fact, it is known that concrete structures require the manufacture of moulds that, once used, are disposed of, resulting in a substantial waste of material.

The fibreglass pools, although they do not have this inconvenience, they require digging a hole in the ground with the proper dimensions, as well as the provision of a concrete support bottom.

Additionally, both concrete and fibreglass pools cannot be moved to another location, and can they have their dimensions (length, width, shape, depth) altered, having no choice but to live with the original dimensions forever. In the case of a pool built at a certain time for

small children to use, for example, it is impossible to increase the depth when these children grow.

Conventional pools have even other inconveniences, such as the need of special techniques to install underwater lighting (that must be planned during the construction), not being possible to alter the number or position of the lights once the construction has ended.

The above m entioned inconveniences have resulted in the search of solutions based on modular techniques, in order to make their costs more accessible, as well as reducing assembly time and making it easier. That trend is exemplified by the patent documents US 3798857, US 3820174 and US 4047340, which describe techniques based on the use of standardised modules.

However, the inventions described in the above mentioned documents have inconveniences that limit their usefulness, as is shown below. The document US 3798857 describes a pool which walls are made up by steel sheets modules, equipped with couplings between the vertical borders of the adjacent modules, whose assembly results in the pool's sidewall, according to Fig. 1. Nevertheless, the illustrated pool has to be embedded into the ground, therefore, requiring - as occurs with fibreglass pools - the digging of a hole for its construction.

In addition, the invention does not take into account the bottom of the pool, which requires specialized and, therefore, costly labour. The same labour is needed too manufacture the concrete blocks that provide support to the walls' anchor beams. As well as that inconvenience, the execution time is long, because of the time necessary for the concrete to harden.

The document US 3820174 describes a pool whose walls are made up by steel sheet modules, complemented by a trellised structure, as is shown in Figs. 2 and 3. The

objective of this invention is to provide a structural array for assembling the ladder's handrails, as well as the support of a concrete deck or pavement surrounding the pool. As in the previous example, the bottom of the pool requires specialized labour, which is also necessary to lay the concrete pavement, these operations that involve the delay necessary for the concrete to harden.

Patent US 4047340 describes a pool which walls are made up by modular plate shaped elements that have, in their vertical borders, groove and tongue joints, those plates being supported by horizontal thrust provided by "X" shaped pre-moulded parts, as shown in figures 4 and 5. The array shown requires the use of a concrete bottom (referenced as 90 in figure 5) to support the wall modules 32, on which they lean, as well as the module internal borders of the deck 20. The distal end of the latter is supported by one of the arms 50 of the "X" shaped part, which bottom arm 50d leans on a metallic bracket 80 that is secured to the ground or - according to the document - a concrete base, not shown in the figure, this base is necessary due to the fact that the stress, resulting from the water's thrust on the walls, are unloaded on to this bracket. In the object of this patent the same considerations regarding the delay introduced in the time of construction due to the time necessary for the concrete to harden, are also applicable.

The three examples of the state of the arte described above also suffer common inconveniences, of which one of the most evident consists of the fact that the pools have fixed depths, since the walls are constituted by predefined size modules. Another serious inconvenience of these models is in the possibility of the occurrence of structural damages in the case of differential pressure of the ground on which the pool lies.

In fact, in the objects described in the documents US 3798857 and US 4047340, any deformation of the ground, on which the brackets or concrete blocks lie, will result in the deformation of the pool walls. Additionally, the differential pressure on the soil on which the bottom lies will produce stress that could result in the appearance of cracks with probable fissures lining and consequent infiltrations that speed up the wear and tear process of the pools.

Objectives of the invention

Due to the above, the first objective of the invention is to provide a constructive design that results in a pool in which the effects of irregularities in the soil compression strength.

A second objective is to provide a building method that allows an easy and fast assembly of pools whenever possible disposing of specialized labour.

Another objective is to provide a constructive design that allows the easy disassembly and reassembly of the pool.

Yet another objective is to provide a constructive design that does not require the use of concrete walls or bottom, blocks or bricks.

Yet another objective is to provide a constructive design that includes the structure of a deck.

Another additional objective is to provide a constructive design that allows easily altering the pool's dimensions and shape.

Another objective is to provide a constructive design that allows assembling the pool both under and above the ground level.

Brief description of the invention

The above mentioned objectives, as well as others, are attained by the invention through a constructive

design, in which the modules that constitute the bottom and walls are interlinked by semi-permanent connecting means in order to make up a unique and non-deformable structure.

According to another feature of the invention, said modules are manufactured of steel sheets, which bestows them lightness, portability and easy assembly

According to additional feature of the invention, the modules that make up the walls are manufactured of different standardised heights, all having the same horizontal dimension, making it possible to obtain several depths by piling the proper modules.

According to yet another feature of the invention, the pool's internal lining is of Vinyl, applied once the pool's structure assembly has been finished.

According to another feature of the invention, the pool's bottom is comprised by a base structure covered by closing modular panels.

According to another feature of the invention, the deck is comprised by standardised elements and is part of the structure.

According to another feature of the invention, the pool's assembly disposing the use of soldering or concreting, all of its components being joined to one another by means of standardised dimensions screws and nuts.

According to another feature of the invention, the set of modules comprises modules with opening for underwater light fittings, proper modules for skimmer and modules for bottom drain.

Description of the drawings

The other advantages and features of the invention will be easier understood through the description of a preferred embodiment and of the drawings that refer to it, in which:

Figures 1, 2, 3, 4 and 5 show pools built according to the known art.

Figure 6 shows, through a perspective view, the structure's aspect of a pool built according to the principles of the invention.

Figure 7 shows, by means of top views, various combinations of side modular panels corresponding to different depth pools.

Figure 8 shows the manufacturing of a typical panel, according to the principles of the invention.

Figure 9 shows, by means of a perspective view, details of the assembly of the panels that make up the wall in one of the pool's corners.

Figure 10 shows, by means of a perspective view, the features of the wall panels in a corner with an angle that is not of 90°.

Figure 11 shows, through a blown up view, the elements that comprised the pool's bottom structure, according to the principles of the invention.

Figure 12 shows, by means of a perspective view, part of the pool's bottom structure once assembled.

Figure 13 shows, by means of a cross section view, the joint of the side panels with the bottom's structure, according to the principles of the invention.

Detailed Description of the Invention

Now, referring in more detail to Fig. 6, which shows a pool exemplifying the invention, not limiting it, comprises the pool 10, with rectangular shape and uniform depth, two sidewalls 11 and 12, two head ends 13, 14 as well as the bottom 15, all these elements being constituted by constructive modular panels, as described below.

Since in the example embodiment described the pool has a standard depth of 1 meter, the sides 11, 12 and the head ends 13, 14 are comprised by panels 17 overlaid on

panels 18 that, in turn, are overlaid on panels 19. All these panels have the same length, corresponding to a standard module, which can have any convenient measurement, in the present embodiment the value of 1 meter is being adopted. Panels 17 have a useful height of 500 mm, panels 18 the height of 300 mm and panels 19, 200 mm. Adding these heights the total depth of 1 meter is obtained. The total height of panels 17 is 630 mm, in order to leave a clearance of 130 mm between the water surface and the pool's border.

Yet according to figure 6, the pool's bottom 15 is made up by panels 16, hereinafter called "tiles", which completely line the bottom's surface, and that are supported by a base (not shown in the figure) comprised by an array of standardised dimension, modular, crossed beams.

Additionally, according to the principles of the invention, all the pool's components have dimensions that allow loading them in pick-ups or small trucks, offering easy and low cost transport.

In the example embodiment herein described, the dimension of the largest part, corresponding to the beams of the base of the bottom, is only 2 meters. This allows them to be transported in buildings' elevators; substantially reducing vertical transport costs to assemble pools in penthouses.

Figure 7 shows some example assortments of different height side panels that allow building pools with various depths. In drawing 7a, the depth of 1 meter is obtained by overlaying a panel 17, with useful height of 500 mm, a panel 18, 300 mm high and a panel 19, 200 mm high.

In drawing 7b, the depth of 1.2 meter results from overlaying a panel 17 of 500 mm, a panel 21 with 400 mm high and a panel 18 of 300 mm.

Figure 7c shows a depth of 1.3 meter obtained by overlaying a panel 17, two panels 18 and a panel 19,

whilst in figure 7d the depth of 1.5 meter results from overlaying a panel 17 (500 mm), a panel 21 (400 mm) and three panels 19 (200 mm each).

A general rule adopted to build the pool's walls is using higher panels next to the surface, adopting progressively shorter panels at greater depth.

It is also noted, in the present embodiment, that the height of panel 17 is greater than 500 mm, the excess 21 corresponds to the clearance between the water's surface 23 and the top of said panel 22.

The drawings of figure 8 show, in details, how a pool's panel is formed from a metallic sheet 30. As figure 8a shows, the developed sheet comprises a rectangular central portion 31 having stripes 32, 33, 34, 35 contiguous to the sides of said rectangle, and separated from the latter by folding lines 31a .... 31d. These stripes have a standardised width and through holes 36, all of the same diameter and located at predefined positions according to the standard adopted. Once these rims have been folded in the direction indicated by the arrows 37, the panel acquires the aspect shown in figure 8b, where the rectangular central portion 31 will make up the pool's sidewall. The hydrostatic pressure 38 is applied on this central portion 31, producing horizontal and vertical bending stresses. The horizontal rims 32 and 34, which act as a beam's vanes, absorb the former. The vertical rims 33 and 35 provide the necessary rigidity against the bending stresses on the vertical plan. In addition to the structural role, the said rims provide connecting means with the rest of the wall's adjacent panels.

Figure 9 shows a layout of the elements that constitute part of the walls and a pool's rectangular corner, formed by the meeting of said walls at 90 degrees. The first wall that comprises sets 41 and 42, each one of which formed by piling the modules 17, 18 and 19. According to the

invention, the vertically adjacent modules are joined through the screw-nut elements 44-45, which traverse the through holes 35 in the juxtaposed horizontal rims, for example in the present case, rim 34 of module 17 with rim 32 of module 18. Horizontally, the same type modules are joined, i.e., module 17 of set 41 with module 17 of set 42, and so on, the same elements 44-45 providing the permanent joint between said modules.

Figure 9 also shows how the joint in a right angle between the first set 43 of the second wall and the first wall of the pool, is structured. According to this figure, rims 33 and 35 of the same type modules make an angle α between them, which, in the present example embodiment, is equal to 90°. The connection between these elements is provided by angle iron 46, which rims also make an angle α = 90°, and whose drilling coincides with the holes of said rims. The same screw-nut elements 44-45 are used to provide the connection of said elements.

It is important to point out that the layout shown is not limited to right angles, the angle between the walls can have different measurements to 90°, such as for example 120°, for hexagonally shaped pools. In this case, the side rims 33' and 35' turned towards the corner between walls will be folded at angles different to 90°, since it is convenient maintain the right angle between the rims of angle iron 46, in order to preserver the necessary rigidity of the structure. In the present example, the said angles are equal to a 75°, as figure 10 shows.

The pool's floor is constituted by a support structure on which the closing panels, called "tiles", are placed. The structure is comprised by rectangular grid formed longitudinally by the sleepers, having crossbeams placed between them; all these elements are modularly dimensioned de

forma modular. Figure 11 shows, by means of a blown up view, the elements that make up said support structure, comprising:

sleepers 51, formed by one or more intermediary modular beams 52 at the central portion, having at both ends the point modular beams 53;

scarves 54 to connect said beams, by way of top joints, formed by short "U" section beams, dimensioned in order to fit in the modular beams;

modular crossbeams 56 placed between said sleepers by means of angle irons 55.

Screws and nuts 44-45 (not shown in this figure), of the same type and dimensions used in assembling the walls, connect said structural elements to each other.

Figure 12 shows part of the structure assembled on the pool's floor, forming a rectangular grid with the same pitch as module **m**. This grid supports the floor's smooth tiles 57, which lean on beams 56. As shown in figure, said tiles have side rims 57a that act as vanes providing the necessary rigidity to resist the bending resulting from the hydrostatic pressure on the bottom. In addition to the smooth tiles 57, special tiles are provided for various functions, such as tile 58 that has a central opening 59 to assemble the bottom's drain.

Figure 12 also shows angle irons 61 that constitute the side panel assembling elements, providing the necessary link between the pool's walls and bottom. These angle irons 61 have through holes 62a on their vertical rims, co-operatively aligned with holes 62b located on the base structure perimeter beams (crossbeams and sleepers), to which they are attached by means of screws 44 and nuts 45. According to the schematic cross section view of figure 13, the wall lower, such as, for example, panels 19, are attached to the horizontal rims of said angle bars, by means of screw-nut sets 44-45 and through holes 63, resulting in the

formation of a unique block by said link. Consequently, the horizontal stress applied to said panels by the hydrostatic pressure are unloaded on the floor's structure.

Although the above description referred to pools, the constructive features of the invention offer a wide range of applications. One of these refers to the building of iced water reservoirs for air conditioning systems in existing buildings, without requiring civil works or structural alterations. In fact, the invention allows assembling a reservoir on existing floors, for example in garages or patios, thermal isolation being provided by polyurethane or polystirene sheets interlaid between the walls and bottom and the vinyl lining.

Therefore, it is understood that modifications can be introduced by technicians in the subject, keeping within the conceptual limits of the invention, the latter being limited by the list of claims below.